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Situational interest of high school students who visit an aquarium

ABSTRACT

The purpose of this study was to investigate how situational interest of high school students was triggered during a field trip to an aquarium. Although museums' role in stimulating interest among students has been acknowledged for some time, empirical evidence about how the specific variable of a museum setting might trigger situational interest is almost non-existent. The present study was conducted as a case study to provide an inductive, explorative investigation of how situational interest emerged during the field trip. A situative approach to the study of interest was applied in the form of a combined analytical tool that captures both social and psychological aspects. Qualitative methods were used to generate data: observation, video recording, and interviews. The findings showed that the aquarium visit triggered a lot of situational interest among the students and led to positive emotions toward the topic. Five situational variables were found to trigger the students' interest: social involvement, hands-on, surprise, novelty, and knowledge acquisition. The situational variables are largely under the control of the teacher and/or museum staff and should be considered when planning museum visits. This study suggests that teachers can find ways to foster students' involvement in specific content areas and increase levels of academic motivation, regardless of prior interest.

INTRODUCTION

This article comprises a report of a case study of situational interest in 17-19 year-old students during a field trip to an aquarium (Fjord & Bælt, Kerteminde, Denmark). The research question was:

How is the situational interest of students triggered during a field trip to an aquarium?

It is often suggested that field trips to museums¹ can increase student's interest in science by stimulating their curiosity and interest in the topic. The Danish Ministry of Education (UVM, 2008) and the National Research Council (NRC, 1996) both recommend that science teaching should be supplemented with field trips to museums and other institutions in order to stimulate students' interest and learning motivation. One key aspect of fostering motivation is to capture the interest of students and to maintain it. It is generally accepted that interest plays an important role in the learning process, and that it, in part, determine what we choose to learn, and how well we learn it. Interest affects attention, goal setting, and learning strategies in ways that make it a particularly relevant variable for improving educational practice (Hidi & Harackiewicz, 2000; Hidi & Renninger, 2006).

Although museums' role in stimulating interest and affect among students has been said to be of significant importance (c.f. Falk, Reinhard, Vernon, Bronnenkant, Deans & Heimlich, 2007; NRC, 2009), it is a field of empirical research that has been given surprisingly little attention. Experienced teachers and museum docents often have a sense of factors that stimulate students' interest in museum contexts. These experiences are predominantly anecdotal and rarely systematized, and investigation of specific conditions that stimulate situational interest in museum contexts is almost absent. A few instructional strategies that may create interest have been described in the literature (Bergin, 1999; Hidi & Renninger, 2006; Paris & Turner, 1994; Ryan & Deci, 2000; Schraw, Flowerday & Lehman, 2001, Schunk, Pintrich & Meece, 2008). These strategies generally include the following findings:

- Use of original materials (these materials often have interesting content that get left out of more generic texts)

¹ In this article the term 'museum' is used as a generic term to refer to all forms of science museums, zoos, aquariums, botanical gardens, science centres, planetariums, nature centres etc.

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- Surprise (presenting material that goes against expectations can create a cognitive disequilibrium)
- Variety and novelty (a variety of activities and novel ideas, content, and tasks may facilitate interest and prevent boredom)
- Hands-on activities (manipulation of objects relate directly to perception and engagement)
- Individual choice of topics based on individual interest (providing some choice and autonomy increases interest and motivation)
- Build on students' social interaction goals (when students perceive that an activity allow them to socialize, they tend to be more interested in the activity)
- Integrate students' individual interests in designing lessons (when teachers connect the lesson content to students' individual interests, it can facilitate attention and situational interest)

However, we still have very little solid knowledge about the specific variables that may trigger situational interest in museum settings. The purpose of the present study was, therefore, to investigate how a field trip to an aquarium promotes interest of 12th grade students. This article does not encompass an examination of the influence of interest on actual learning, I write under the assumption that interest generally, but not always, promotes learning (Hidi, 1990).

Definition of interest

In recent theories (Hidi & Renninger, 2006; Krapp, 2002), interest is primarily defined as a phenomenon, which emerges from an individual's interaction with his or her environment. The etymology of the term *inter-esse*, 'between-being', points in the same direction. Interest is defined as a positively charged cognitive and affective experience that directs attention to the activity or object at hand (Rheinberg, 2008). Interest is a content-specific concept, i.e. it is always related to specific topics, tasks, or activities. This relationship is both cognitive (involving knowledge and experience) and affective (involving positive feelings and appreciation). Interest is characterized by focused attention and engagement, and the feeling of pleasure, happiness and well-being are typical emotional aspects of interest-based activities (Prenzel, 1992, Schiefele, 1991, Schraw & Lehman, 2001). Hidi and Harackiewicz (2000) argue that students, who are

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interested in a particular subject, exhibits greater attention, are more persistent, feel greater joy and learn more than students who do not have this interest.

Two types of interest have been the primary focus of educational research to date: *situational* and *individual interest* (also referred to as *personal interest*). Situational interest denotes certain conditions and/or stimuli in the environment that focus attention, and which cause an immediate affective reaction that may or may not last over time (Hidi & Renninger, 2006; Krapp, 2002). Individual interest is conceptualized as a relatively stable motivational orientation or personal disposition that develops over time in relation to a particular topic or domain, and which is associated with increased knowledge, value, and positive feelings (Renninger, 1992, Renninger, 2000; Schiefele, 1991). While the situational interest approach focuses on individuals' response to environmental factors that promote interest in a particular context, the individual interest approaches concerns enduring preferences (Hidi & Baird, 1986; Mitchell, 1993). Although situational and individual interests are distinct, they are not dichotomous phenomena, but may be expected to interact and influence each others' development. The experience of being interested in a concrete learning situation is the result of a dynamic interaction between individual and situational factors (Hidi, 1990; Krapp, Hidi & Renninger, 1992).

Situational interest may, over time, have powerful effects on students' individual interest in the subject (Hidi & Renninger, 2006; Krapp, 2002, Schiefele, 1991). Important with respect to learning is the question of how to capture interest and hold it for an extended period of time to stimulate a lasting state of intrinsic motivation. Let us assume that students who were exposed to an exciting attraction or activity in a museum are stimulated and pay more attention than they did before. For some students, this interest may evaporate as soon as the museum visit ends. For others, the interest triggered in the situation persists over time and may develop into an individual interest. Very little is known about this process, even though it carries significant educational implications for educators who strive to promote a long-standing interest in science. Whereas teachers have little influence over the individual interests (or disinterest) students bring to class, they can influence the development of interests by, among other things, including field trips to foster situational interest. From an educational point of view, situational interest is the real topic of concern,

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because it can be a potentially powerful way to help students who have little or no pre-existing interest in a subject (Ainly, Hidi & Berndorff, 2002; Deci, 1992; Hidi & Harackiewicz, 2000; Mitchell, 1993).

Although the importance of stimulating situational interest has been acknowledged for some time, it has primarily been investigated within other fields such as reading. The potential sources of situational interest have rarely been measured in empirical studies of science education. While there is a growing amount of research into students' learning in museums, very little previous research have considered the specific variables that might trigger situational interest in these settings. To alleviate that, this study was set up to identify situational sources of interest in a museum setting.

METHODOLOGY

It is relatively easy to document students' interest, because interests can be recorded directly by questioning (Lehrke, 1988). However, it can be difficult to assess exactly what a student means by 'interest', due to the embeddedness of the concept in the everyday language (Valsiner, 1992). When a student speaks positively about an object or activity of interest, this says nothing about the students' level of commitment to this object or activity. To assess how interested a student is in particular objects or activities of interest therefore requires some careful considerations. To address this problem, a descriptive interpretive approach was adopted in this study in order to identify what happens in the classroom and aquarium context when meanings are negotiated by teacher and students from their different perspectives and intentions. The basic aim was to understand the context in which interest was created and thus ensuring the 'ecological validity' of the results. Such an objective called for collection of open-ended information about the population and phenomena of interest from a variety of sources. Thus, a qualitative methodology was deemed the most appropriate means to achieve the research objectives of this study; to investigate how a field trip to an aquarium promotes interest of 12th grade high school students.

Interpretive framework

A situative approach to studying interest was adopted in this study. Situative studies of motivation draw on a number of social theories to frame motivation as arising from individuals' interaction in social systems. In this study, the situative approach describe a theoretical position that combine cognitive

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approaches to motivation with the situative approaches of Greeno (1998), Lave and Wenger (1991), Rogoff (1995) and Wenger (1998). The situative view of interest concerns understanding social systems as well as the individuals who co-construct them (Jävelä, Volet & Järvenoja, 2010; Nolen 2007, Nolen & Ward, 2008; Nolen et al., 2009). The theory of motivation that I build on involves the recognition that interest is, to some extent, a situated phenomenon, where the content and meaning of the interesting object or activity in question is mediated by the social context (Nolen, 2008). I write under the assumption that the interest of the individual is understandable only in relation to his or her social context. Meanings, values, norms, and goals are socially mediated in situated theory, and they create the context in which interest form and develop. I treat the phenomenon of interest as both a collective and an individual phenomenon that is framed by the negotiations of meaning practised. Interest, in other words, is conceptualised as an inter-psychological phenomenon of participation in social practices (Pressick-Kilborn & Walker, 2002).

The interpretive framework uses a combined analytical tool that captures *both* the social aspects of interest, represented by the ‘community of practice’, *and* the psychological aspects of interest, represented by ‘the individual-in-the-community-of-practice’. The analysis comprises both the class’ joint practice in the classroom/field trip setting, *and* on the students’ ways of contributing to the constitution of this community of practice. This methodological approach acknowledges the diversity of students’ experiences, but at the same time regards this diversity as socially situated. This is consistent with Laves’ (1988) claim “to incorporate the active character of experience into the unit of analysis” (p. 180) and builds upon Wenger’s (1998) discussion of communities of practice, insofar as the approach is designed to identify the negotiated social structures and norms that emerge through students’ engagement. This approach, which coordinates both social and psychological perspectives, is very much inspired by Cobb’s analyses of the evolution of mathematical practices in the classroom (Cobb, Stephan, McClain & Gravenmeijer, 2001), but is also closely related to a number of other proposals. These include, for example, Billett’s (1996, 2001) discussion of the relationships between social practice, activities and individual cognition, and Rogoff’s (1995) distinction between three levels of analysis that correspond to personal, interpersonal and community processes.

The analysis’ social perspective is based on the community constituted by the students and their teacher, and is focused on the negotiation of meaning in their shared practice. While the psychological

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literature primarily explains 'interest' in cognitive terms, the 'negotiation of meaning' approach focuses on shared practice. The negotiation of meaning can be described as a process in which active, engaged participants in a community of practice are constantly involved in 'negotiating' the meaning of what they are doing, the things they are doing it with and the ways in which they are doing it (Wenger, 1998). In this process certain things (routines, forms of behaviour, meanings etc.) are more or less fixed and provide the starting point and normative guidelines for what one does and how one does it, while others are still open for negotiation about their meaning. This process is focused on how the social processes frame students' situational interest and engagement in the learning contexts.

The analysis' psychological perspective describes the individual's life-world and his/her mode of acting within it. It is aimed at the individuals' experiences of interest associated with their participation in shared practice. It is thus not designed specifically to identify the cognitive and affective aspects of the individual's interest.

The social and psychological perspectives have been put together in one progressive and coherent analysis. The psychological analysis is carried out concurrently with the social analysis, which addresses the socially constituted meaning of the individual's participation. The two ways to look at and make sense of what is going on in classrooms are coordinated, so individual students and the classroom community is not viewed as separate, sharply defined entities. The resulting analytical approach brings students' situational interest to the fore while situating that interest in the social context of their participation in classroom or aquarium activities.

Within this analytical framework, the social and the psychological perspectives are *not* independent of one another. The one cannot exist without the other, and vice versa, insofar as each constitutes the background for the other appears. For example, the engagement of the class is constantly negotiated (social perspective) as the teacher and students interpret and respond to each other's actions (psychological perspective). On the other hand, the teacher's and students' interpretations and actions (psychological perspective) do not exist in a vacuum, but must be seen as part of a shared practice (social perspective).

The participants

The students who participated in the present study attended a Year 12 biology class of 16 students (13 girls and 3 boys) in a public high school. The school is located in a small rural town on the island of Funen, Denmark. The teacher, Mr. Nielson², taught the biology class 5 lessons per week, and each lesson lasted 45 minutes. The biology lessons were dominated by traditional curriculum and instructional methods; teacher talk, blackboard, and textbook. The teacher had previously made trips to the aquarium with other biology classes. The teacher and the museum docent planned the visit together. The aquarium trip was intended by the teacher to be an integral part of the school curriculum about ecology. The visit itself, including all activities during the aquarium trip, was planned and directed by the museum docent. The researcher was not involved in planning or directing the aquarium visit.

Data collection

Data were collected in three phases in this study. In Phase 1, biology lessons were observed, starting 8 weeks before the Aquarium visit. During this pre-visit period, students were taught ecology and population biology. In the beginning of Week 1, the class made a field trip to a local beach to make a habitat study in order to determine the beach biotope. This field trip marked the introduction to the subsequent ecology lessons (Week 1-5). During Week 6-7, the lessons were on population biology, and not specifically related to the trip to the aquarium. The class prepared the aquarium visit during Week 8, during which they read a scientific text about the ecology of Kerteminde fjord. The text describes the biochemical processes that affect release of nutrients from the ocean floor, and how the interaction between filtering organisms (jellyfish and ascidians) establishes the biological structure in the fjord. Based on the text, each student selected an organism they would focus on and collect information about during the visit. They were requested to write a report about 'their' organism, to be handed to the teacher at the beginning of Week 10. Phase 2 was the aquarium visit itself (end of Week 8). The visit lasted an entire day, from 9 – 16 am. Phase 3 occurred in the classroom following the trip. This phase was almost 2 weeks long (Week 9-10), involving in-class evaluation of the aquarium tour and completion of follow-up learning activities relating to the trip.

² All names used in this paper are pseudonyms to protect the anonymity of the participants.

Data collection methods

Four forms of data collection were employed in the study: participant observations of the classroom and field trips, video recording, interviews, and student work.

Classroom and field trip observations. Classroom and field trip observations were ‘naturalistic observations’ (Angrosino & Mays de Perez, 2000), i.e. embedded in the regular settings of the activities. The observations were focused by situations where students were attentive and emotionally engaged (committed talk, emotional exclamation, or laughter indicates attention and/or engagement in a lively discussion or spontaneous debate on a topical issue). Classroom observations gradually became more focused as classroom routines became apparent. Observations were recorded in field notes and reviewed and expanded later in the same day for preliminary analysis to help inform subsequent classroom observations.

Video recording. The entire 10-week period was recorded with a video camera. The video camera was discreetly placed on a stand in a corner of the biology classroom. The entire class was filmed. The goal was to capture dialogues of meaning-negotiation in the classroom. Video recording was by hand-held camera during the field trip to the local beach (Week 1) and to the aquarium (end of Week 8). The entire class was filmed when students were assembled, except when students were split in groups, one group was followed in order to capture student action and dialogues. Students seemed unbothered by the camera during the aquarium visit. They were so absorbed by what happened around them that they apparently did not notice that they were filmed up close.

Video recordings were later in the same day reviewed for preliminary analysis and compared to field notes. Full transcripts were made of relevant sections of recordings from the classroom and the aquarium visit.

Interviews. In studies of situational interest, it is preferable to use only a very brief procedure for gathering data in order to capture the short-lived fluctuations in interest levels as they occur (Alexander, Kulikowich & Jetton, 1994). Therefore, it was attempted to identify situational interest in the situation, since there is a risk that the significance and meaning for the individual and the feelings associated with the interesting object or activity fade over time.

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Informal interviews were conducted in the classroom (Week 1-10) and during the field trips to the beach (Week 1) and the aquarium (Week 8) as short-term informal conversational interviews (Patton, 1988). These informal interviews involved all the students. Students were interviewed alone or in small groups of 2-3 individuals when the situations made it possible. They were asked how they experienced a given situation, whether it was interesting and why it was or was not interesting. The informal interviews were short: 2-4 minutes, and students' responses were recorded as notes. This way, the interviews did not interfere with the flow of the activities in the classroom or during the field trips. Informal conversational interview is a method of interviews where questions emerge from the immediate context and are asked in the natural course of things; there are no predetermined questions or wording. The advantage is that the salience and relevance of questions increases, because interviews are built on and emerge from observations; the interview can be adapted to individuals and circumstances. On the other hand, informal interviews have limitations. Interviews focus attention on a situation that may not have been considered interesting. The attention might spark an interest. Besides, interviewing small groups of individuals involves group-dynamic aspects that might mediate individual's interest development.

Formal interview was conducted as semi-structured qualitative research interview (Kvale, 1996). The students were asked to volunteer to be interviewed. 6 students volunteered and were interviewed twice; during Week 7 and during the following 3 days after the aquarium visit (Week 9). Each interview lasted between 50 and 80 minutes. The teacher was interviewed in the end of Week 9, following the same interview schedule as the students. Further, the teacher interview included questions about his goals, rationale, and expectations for the students and his general educational philosophy and approaches to field trips.

This type of interview is aimed to produce qualitative descriptions of the interviewees' life-world in order to interpret the meaning of the described phenomena. The interviews were structured around the obtained field notes and responses from the *in situ* informal conversational interviews, and they were recorded on video. Full transcripts were made of all interview video tapes.

Student produced work. The students each produced a biology report based on their findings. The biology reports were photocopied and reviewed to gain further insight into the students' experiences. In some cases the reports clarified issues that arose from other data resources.

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These four sources of data were deemed necessary to allow ‘triangulation’ and to provide a valid interpretation of what students experienced as interesting during the aquarium visit. These sources together provided a rich, holistic interpretation of students’ interests in the aquarium context.

The aquarium visit

The aquarium Fjord & Bælt is located in the heart of Kerteminde, a traditional fishing harbor at the east coast of Funen in Denmark. The exhibition’s themes include nature, environment and the history of the local fjord and fishing harbor. The exhibitions are based on aquariums and pools, visual information details, hands-on attractions, and touch pools where visitors can touch fish, crabs, starfish etc. The aquariums’ school service offers a number of programs, some at the aquarium and others in nearby areas like the fishing harbor, the shallow Kerteminde fjord areas, or the Great Belt. Tuition is based largely on students’ active participation in various activities, such as going to the sea by boat to explore the ocean floor or cutting up a fish and studying its guts.

Upon arrival at the aquarium, the class was greeted by the museum docent, who gave a brief presentation of the aquarium and an introductory talk about whales and sharks that had been observed in the Great Belt. As introduction to the subsequent underwater activities, he then showed 30 minutes of underwater video footage of wildlife in Kerteminde fjord and the Great Belt, and described where and how to search through seaweed and eel grass to find the fish. Then everyone (the students, the teacher, the museum docent, and the researcher) put on wet suits, fins, snorkels and masks. Transportation to the site, 1 kilometer North of Kerteminde, was by rubber boat. Upon arrival, the students went into the water amid much yelling and excitement. The students spent about 90 minutes in the water; some stayed near the beach where they could reach the bottom, whereas others ventured a little farther out where the water was about three meters deep. The museum docent collected animals in a net and placed the animals in a large, water-filled tray in the boat. Back in the Kerteminde fishing harbor, situated in the port basin, the museum docent explained about the fish. He staged his presentation by showing the live animals he had collected, and sent the live fish around for the students to touch. The animal presentation was supplemented with ‘good stories’, about the specific features or characteristics of individual organisms, like how one can *feel* the difference between flounder (*Platichthys flesus*), dab (*Platichthys flesus*) and plaice (*Pleuronectes platessa*) by

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roughness of their skin. The museum docent gave a 30-minute presentation of the physical conditions of Kerteminde fjord, including the influence of tidal water exchange and pollution. The students went out to a shallow area in the fjord, where they were provided with waders, underwater telescope and nets. The students spent about 30 minutes collecting animals and plants. This soon felt tedious for the students, because they only caught the same animals: shrimp and a few specimens of crab, sea snail, and jellyfish. Two student groups competed to capture as many shrimp as possible. During the subsequent discussion, the museum docent showed animal specimens and told 'good stories' about them. Furthermore, he explained how fauna variation has increased over the years, which can be seen as an indicator that the fjord is improving. The visit ended at a large touch pool inside the aquarium, where students were encouraged to hand-feed the fish with the live shrimp they had caught in the fjord.

In the subsequent biology lessons (Week 9), the visit was orally evaluated, and agreements about scope, content, and delivery date of the biology report were made. Post-trip activities included discussions about Kerteminde fjord's ecological condition and reading of supplemental literature.

DATA ANALYSIS

Grounded theory was used for the data analysis (Charmaz, 2006; Strauss & Corbin, 1990). I developed and tested conjectures about both communal practices (social perspective) and individual students' experience of interest associated with their participation in shared practice (psychological prospective), when I analyzed what the teacher and individual students said and did in the classroom and during the aquarium visit. For the psychological perspective, I viewed the teacher and students as a group of individuals who engage in acts as they interpret and respond to each other's actions. For the social perspective, I viewed the teacher and students as members of a local community who jointly establish communal practices. I established the basic unit of analysis, that of classroom practices and students' diverse ways of participating in them, when I combined interpretations of what the teacher and students were doing from the two perspectives.

The actual analysis fell in two phases. The first phase of the grounded method involved working through the data chronologically, episode by episode. On the basis of the field notes, daily review of video

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recordings, and reading of interview transcripts, questions and tentative assertions were generated (Tobin, 2000). Incidents that showed evidence of students' interest were noted and compared with the field notes.

The interview transcripts were first informally reviewed to get a general sense of any themes they might contain. Interview transcripts were then 'opened' and structured by an open coding. During open coding, the interview transcripts were coded line-by-line for emerging themes, keeping in mind the central focus of revealing and reporting students' voices. Through this process, justifications for what the students found interesting were conceptualized and classified. Codes that emerged from individual transcripts were compared, and codes that represented similar factors were combined.

In the second phase, the resulting codes were applied to all transcripts, and definitions of codes were further specified to enhance their fit to the data. During this process, the number of codes was reduced significantly, leaving just 5 code domains: 'social involvement', 'hands-on', 'surprise', 'novelty', and 'knowledge acquisition'. These code domains can be regarded as unifying headers for other, closely related codes. The final list of codes is listed in Table 1.

Table 1. Codes used to analyze data

Code domain	Code	Definition	Number of students who mentioned this factor (n=16), based on interviews and informal conversations
Social involvement	Social involvement	Being together as a group	15
	Community	Feeling of belonging to the community	13
Hands-on	Hands-on	Handling of objects	16
	Concrete	Concrete objects (versus abstract information)	3
	Live animals	Live fish, crabs, shrimps etc.	16

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	Authenticity	'Real' biology (versus abstract information in texts)	3
Surprise	Surprise	Unexpected or discrepant information	12
	Aha-experience	Sudden and unexpected flash of insight	4
Novelty	Novelty	Something new	15
	Unusual	Things that are different from daily practice	12
	Suspense	Not knowing what was going to happen	8
	Variety	Change in activity	4
Knowledge acquisition	Knowledge acquisition	Acquiring knowledge and relating to prior knowledge	8

FINDINGS AND DISCUSSION

The results show that several factors triggered situational interest among the students during the visit. Five sources of situational interest were identified and will be discussed in the following sections. The order in which they are listed does not reflect their frequency or relative significance, nor should the list be regarded as a complete taxonomy for instructional use.

Social involvement

This category refers to interest that is stimulated by interpersonal interactions. Social involvement was the most commonly referred source of interest by the students. Group dynamic conditions showed up frequently in the data, primarily when they put on wet suits, sat together in the boat, and to some extent also on and in the fjord, where groups of students competed to catch shrimp.

Catching shrimp was fun, but not interesting. Jacob put it:

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“It was fun, you just caught shrimp, something you could do elsewhere, but you catch an incredible amount, and then we had a little competition about catching the most, so it was really fun” (Jacob, interview Week 9)³.

The six in-depth interviewed students pointed to the situation where they put on wet suits as ‘fun’ and ‘social’. Sarah said that:

“It was fun [laughter], this is where the social kicks in. It was just damned funny, because none of us had any experience with a wet suit, and it sticks to our body, and some of them were dripping wet, and there was sand in them and it was just silly. So this experience helped to strengthen the social bonds” (Sarah, interview Week 9)

Several students said “we look stupid in these costumes” and one of the girls exclaimed ironically, “I feel really sexy in this suit” (transcripts from video). The students reported the activity as great fun and interesting, because it was an unfamiliar activity that required little cooperation.

Similarly, when students jumped into the cold water at the diving location, many had trouble with their balance and found it hard to maneuver around in the shallow water with fins, and several were caught by the waves. For Sarah it was “so much fun splashing around like a demented sea lion”, because her peers had similar problems with balancing and maneuvering around. In these examples, student’s involvement was largely motivated by group dynamics.

Not everybody found it fun, however. Emma was overturned by the waves and felt scared: “I felt that the waves were so violent and I had not found out what I should do, so he [the museum docent] came and explained what I should do, and then it was not so bad”.

Social involvement in group work has been reported as an important source of interest (Hidi, Weiss, Berndorff, & Nolan, 1998; Isaac, Sansone & Smith, 1999; Mitchell, 1993), whereas others have found social involvement to be a source of interest of less importance (Dohn, Madsen & Malte, 2009; Palmer, 2009). However, the five studies differed not only in context and types of students, but also in measuring procedures, so the reasons for this difference are not clear. During the aquarium field trip, the students were not working in groups as such. Instead, they socialized as one group when the situation allowed. In these

³ Transcripts are translated from Danish by the researcher.

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situations, the sense of community had a great impact on interest. Social involvement seems to have a significant mediating effect on motivation and commitment. Deci (1992) argued that humans have a basic need or drive for social contact, and that this explained why interpersonal involvement can arouse interest. The results presented here seem to support Krapp's (2005) hypothesis that the amount and quality of need-related experiences have an influence on the emergence and stabilization of interest and interest-related motivational orientation.

It has been suggested that free choice is of special importance in museum settings, because the settings allow learners to select between several learning options (Falk and Dierking, 2000). A number of studies suggest that freedom of choice increases students' interest and task engagement (Palmer, 2009; Parker and Lepper, 1992; Paris, Yambor & Packard, 1998; Zuckerman, Porac, Lathin, Smith & Deci, 1978). Choice is hypothesized to promote a greater sense of self-determination because it satisfies students' need for autonomy (Deci, 1998). In the present study, the data analysis did not reveal choice as a source of interest. This does not mean that the students had no opportunities to make choices – they chose themselves to approach shrimp fishing as a competition, for example. In this situation, choice was strongly influenced by group dynamic conditions, and thus categorized as such. It should be emphasized that choice is not a simple construct – choices that students make in learning situations are almost always influenced by other factors such as previous knowledge or individual interests (Flowerday, Schraw & Stevens, 2004).

Hands-on

Hands-on was an important source of situational interest in this study. It was obvious that the living specimen of fish, shrimp, and crabs offered the students highly personal hands-on experiences, and that these experiences generated interest. The students experienced it as fun, fascinating, exciting, and interesting, but also a little creepy to handle live fish. The hands-on experience seems closely related to surprise and aha-experience, both at the sensory, tangible level and at the cognitive level. The following examples illustrate the difficulty of isolating hands-on experience from surprise. It seems, however, that hands-on experiences have had a major impact on situational interest:

“It was really fun to touch such a fish, I had no idea how they would feel. Well, I have some aquariums at home but I don't touch my fish. For example the snake pipefish [*Entelurus aequoreus*], when

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you handle it, you can just feel it is really 100% muscle, the way they are writhing” (Isabella, interview Week 9).

During snorkel diving, Jacob caught a pogge (*Agonus cataphractus*) by hand. His hands-on experience was also related to surprise:

“I found a pogge, I saw it at the bottom, and so I tried to dive down and get it up. It was completely motionless. Normally I would have thought that fish would swim away. This was something completely new. You might have had such a dead fish in your hand down at the fish market, but to hold such a live fish, it is incredibly exciting and fun because I had caught it” (Jacob, interview Week 9).

His comment suggests that it was significant that he himself had caught the fish.

Hands-on experiences have been reported as important sources of interest in the literature.

According to Middleton (1995), Palmer (2004), Paris, Yambor and Packard (1998), and Zahorik (1996), there is a clear correlation between students’ hands-on experiences in educational contexts and interests. Dohn, Madsen and Malte (2009) have recently shown that hands-on laboratory experiences with live animals can generate interest. It is important to note that even though hands-on is related to an object, there is not necessarily a direct correlation between a hands-on object and interest. One can therefore not take for granted that hands-on activities always generate interest. This can be illustrated by students’ lack of interest during shrimp fishing in the fjord. Even though shrimp fishing was a hands-on activity, the lack of novelty made the activity tedious. Interest was caught, however, when the museum docent subsequently explained how to distinguish between shrimp species based on the length of their rostrum. The findings suggest that hands-on activities can generate interest - particularly when the activities relate to live animals - but hands-on is not always a sufficient condition for capturing interest.

As Palmer (2009) notes, the issue of why hands-on is so appealing to students is still an open question. One possibility is that physical activity may have allowed a number of other sources of interest to come into play. For example, when the students were handling live fish at the boat tour, several also reported: (1) surprise and aha-experiences, (2) novelty, and (3) social involvement through the sense of community. Each of these factors – surprise, novelty, and social involvement - was present in the situations

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of live animal handling, so it is possible that the significance of hands-on was that it facilitated these allied factors.

Surprise

Another main source of interest was surprise, i.e. unexpected or discrepant information. The category refers to a knowledge-based interest that manifests itself suddenly, such as an unexpected insight or appreciation of something. For example, all 16 students were caught by surprise at the diversity of wildlife in the Great Belt. During the introduction, the museum docent showed pictures of sharks that had been caught locally, including a 3 meter long Basking shark (*Cetorhinus maximus*). This information stimulated immediate interest among 5 students; they associated sharks with tropical coral reefs and were surprised to hear that sharks live in Denmark.

Several students were caught by surprise at seeing how well some fish species were adapted to their environment. For Daniel, it was interesting to see a lesser pipefish (*Syngnathus rostellatus*):

“It was really fun, the pipefish, it is a very strange fish, I think, and it was fun because it was almost like having a piece of seaweed in my hand, it was very similar to seaweed, quite strange in fact. It was a little funny because I did not know such a fish exists that stands upright and looks like seaweed. It was really an aha-experience for me” (Daniel, interview Week 9).

Esther had a similar experience with the snake pipefish:

“It’s really a special animal that has special shapes, which suggests that it has an even more special adaptation to the environment they live in” (Isabella, interview Week 9).

She had never heard of or seen a snake pipefish, except that the museum docent had previously shown a short video about it and explained about its relationship with seahorses. Her comment suggests that she understood that the snipes’ striking appearance and behavior is due to adaptation to coastal seaweed forests.

Esther was one of the few students who had tried snorkel diving before. She was surprised at the variety of life in the Great Belt:

“I have a completely different view of the Danish oceans after this. I never thought it was exciting to snorkel dive in Denmark because you do not see any fish, I just thought we’d see crabs and jellyfish. But the

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small fish [two-spotted goby (*Gobiusculus flavescens*)], and the long pipefish, hiding among the seaweed, I haven't seen them before, thought that was really cool" (Esther, interview Week 9).

The fish in the touch pool stimulated interest among most of the students, due to their unexpected sizes:

"I think it was very fun to feed such an animal [a turbot, *Psetta maxima*] because they were really big. Well, I don't go to fish markets often, or eat much fish, but the flatfish was *huge*, it had a mouth so it could almost bite a finger off" (Sarah, interview Week 9)

The six in-depth interviewed students unanimously reported that they were surprised at how rich and diverse life was in the Great Belt, and that the snorkel diving had revealed a completely unknown, fascinating world below the surface. They experienced many organisms they had not previously seen or heard about. They all agreed that the museum docent's video introduction to snorkeling had been crucial to see so many animals.

The experience of being interested seems to be the consequence, rather than the cause, of the intellectual activity involved. One reason why surprise can trigger interest may lie in closely related variables like optimal challenge, novelty, and optimal discrepancy between input and cognitive structure (Berlyne, 1949, 1960; Deci, 1992). Although surprise involves the knowledge of the individual and thus could be classified as an individual factor, I classify surprise as a situational factor because surprise depends on situational conditions. Creating surprise by presenting material that goes against expectations or background knowledge can create a cognitive disequilibrium for the students; they may then attempt to figure out why their beliefs are discrepant, and then they may become more engaged and involved (Bergin, 1999).

Novelty

Responses were placed in this category if they indicated that interest had been aroused by something new or unusual or suspense prior to a novel activity. Novelty and suspense were a significant source of interest during the rubber boat trip and during the subsequent snorkel diving. Jacob commented this way: "It was incredibly fun, it was like an adventure going out with the boat" (interview Week 9).

During the activities in the fjord, it was evident that fishing with a shrimp net generated little or no interest, so the students were asked to explain why. Some students commented that "not to catch anything

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else than shrimp was boring”. The in-depth interviews (Week 9) revealed two main reasons. Firstly, the experience certainly proved an anticlimax to snorkel diving a few hours earlier. Furthermore, the students considered shrimp fishing an ordinary or everyday activity, “like you did in kindergarten”, or “like you did as a child, running around with a net at the beach and catching shrimp and things like that”, as two of the students put it. Students’ comments suggest that they do not consider fishing shrimp with nets a normative activity for their age and grade.

The second reason is due to monotony of just catching shrimp (as well as a few crabs and some jellyfish). Jacob had hoped to catch fish:

“Maybe, if we had caught some special animals or some big fish it would have been much more exciting and interesting, because it would have been something different” (Jacob, interview Week 9).

His statement suggests that something different would make the experience more interesting. Since something new or unexpected can spark situational interest (Mitchell, 1993), lack of something unexpected, surprising or different seems to have a negative impact on situational interest. When something new is experienced repeatedly, novelty disappears, as Isabella put it:

“I had never tried to use the shrimp net before, so it was fun, but only for five minutes, because I kept catching the same again and again. We worked in the dark, because we just plodded around in giant rubber boots, and whirled [the sediment] up so we couldn’t see anything, unless we took the underwater telescope, and then stood perfectly still until the sediment had subsided, but when we walked around and whirled it up, we could not see anything half an inch down. I’d really have preferred that we had spent a little less time on it” (Isabella, interview Week 9).

When the students were snorkel diving in the Great Belt, they could observe the undisturbed wildlife. In the fjord, it was difficult to see anything in the water, partly because the wind was blowing quite strongly, partly because the sediment was whirled up by the students’ activities, as indicated by Isabellas’ comment above. This does not mean, however, that the students were not having fun or that they were unmotivated. Several students reported that “it was really fun”, because they competed to catch the most shrimp. Group dynamics thus contributed to maintain some involvement with the activity.

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New stimuli attract attention and curiosity (Berlyne, 1949). However, a stimulus that was once novel obviously eventually become familiar. If the stimulus does not have additional motivational attributes, it will lose effectiveness. What counts as novelty depends, of course, on the situation. When the students were fishing shrimp, for example, Isabella found it fun in the beginning, because the activity involved use of shrimp net and waders, which was new to her. But soon the activity became tedious due to lack of novelty.

Novelty, conceptualized as a gap between information known and unknown or information deficiency, has been thought to be a unique function that can motivate a persons' exploratory behaviour (Chen, Darst & Pangrazi, 2001). Novelty is closely related to surprise, as Deci (1992) argues: novelty and discrepancy share a commonality in that they both refer to ideas that are not fully mastered. Studies of reading have also identified novelty as an important source of interest (e.g., Hidi, 2001). In the present study, novelty (i.e., new or unusual) was categorized together with suspense (i.e., not knowing what was going to happen) and variety (i.e., a change in activity) as it was sometimes difficult to separate them.

Knowledge acquisition

In several cases students reported interest sparked by acquiring knowledge. The informal responses refer to a knowledge-based interest which is generated by acquisition of relevant knowledge. This category has much in common with the category 'surprise' but is much more persistent and of more individual character. Knowledge acquisition is a source of interest as confirmed by responses such as: "When you explore the limited diversity of species in the fjord and hear about pollution" or "The overall understanding of the environmental conditions of the fjord". Measuring temperature and salinity on the boat, for example, was an interesting activity for some of the students, because they could compare the results with the results of the field trip to the beach (Week 1). Daniel put it this way:

"We could just compare and see that there was still some more [salt] here [in the Great Belt], but it was only meaningful because we had just worked with it and I had just calculated it and things like that, so I think it was a lot fun. The results became meaningful then, because if you just were told that there were 22 per thousand, well..." (Daniel, interview Week 9).

Daniel understood the principles of water mixing in the Great Belt. The new insight into how the two localities differed in salinity aroused interest in him:

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“All that about the Baltic Sea, the rivers bringing fresh water and things like that. And then you suddenly see it in relation to each other, I did not know that before, all that about the salty water from the North Sea and such. I think it was really interesting”.

According to Alexander et al. (1994), there appears to be a reciprocal relationship between knowledge of a domain and interest in the domain. That is, we pursue learning about things we are interested in, and the more we know about something, the more interested we become. Previous research has shown a relationship between two different types of knowledge and situational interest. *Topic knowledge* refers to information an individual possesses about a specific topic such as ecology, whereas *domain knowledge* refers to information an individual possesses about a general field of study such as biology (Alexander & Jetton, 1996). It has been suggested that knowledge is related to both individual and situational interest, even though knowledge appears to be related more strongly to individual interest (Alexander et al., 1994; Schraw & Lehman, 2001; Tobias, 1994).

In the study of Palmer (2009), learning (i.e., the acquisition of topic knowledge) was found to be the most important source of situational interest among Year 9 science students in inquiry lessons. In the present study, analysis of interviews, informal conversations, and class dialogues indicate that background knowledge (topic knowledge) played a larger role as a source of interest in the classroom than during the aquarium trip. It is important to consider the visit to the aquarium as one event in an 8-week ecology course. Students' individual experiences in the fjord had the consequence that the classroom's academic content (the nitrogen cycle, for example) became personally meaningful to some. This is illustrated in the following interview extract:

“When you read the text about the fjord, it's just some tables and some figures, but when you come out and see it for real, then you get an idea about what's really happening, you can follow the [nitrate] curve in the text, and you know what it means. It gives you a greater understanding of the substance, I think” (Jacob, interview, Week 9).

The example suggests that situational interest can be generated and maintained when the learning content appears meaningful to the individual, as proposed by Mitchell (1993).

Implications for field trips

The teachers' rationale for the aquarium trip was primarily to create interest among the students. Many years of teaching had convinced him that field trips reinforce students' interest and motivation: "They [the students] should go and see some of what we've talked about in order to give ecology a boost, so that they experience ecology as more fun than they perhaps thought it was" (interview, Week 9). Mr. Nielson did indicate that he hoped learning would occur on the trip, but he was vague about what exactly his learning goals were.

Before the excursion to the aquarium, interviews and informal conversations revealed that all of the students experienced the topic ecology as 'abstract' and 'a little boring', especially when it concerned biochemical processes and nutrient cycles, as presented in the text about Kerteminde fjord. The teacher was aware of this, which is indicated in the quote above. One of the students said that: "Ecology is not my favorite topic, but he [Mr. Nielson] knows how to make it interesting" This statement was typical, and it suggests that student's individual interest in ecology was relatively low, while the situational interests were more variable, depending on the instructional strategies of the teacher.

When the trip was evaluated in class (Week 9), students commented the trip like "Great trip!", "Fun and interesting", and "Exciting to try snorkeling". These comments imply that certain activities within the aquarium trip had created not only interest, but also enjoyment and perception of fun. During subsequent interviews and informal conversations (Weeks 9-10), all 16 students said they found ecology more exciting and interesting than before the trip, and all reported more motivation to deal with ecology than before. As the interviewees spoke about sources of interest, they also used a range of other affective terms to describe how they felt. These included "motivating", "liking", "fascinating", "fun", "pleasure", "happiness", "enjoyment", and "delight". The students' use of these words would suggest that not only interest, but also a whole raft of other positive attitudes had been activated through the sources of situational interest. Sarah, for example, had previously in front of the class complained loudly that ecology was "dull and abstract", and asked "when are we going to deal with physiology?" Her attitude was also reflected in the interview, where she commented the scientific text about Kerteminde fjord as "incredibly boring". However, Sarah's experiences during the aquarium visit, especially around snorkel diving, caused a very marked change of attitude:

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“It was really exciting! I have really regretted that I have smeared ecology [laughter], I've said it was pretty boring, but going out there, and there was such a good atmosphere and it was just damn fun, and that of course made ecology fun too, it affects it, it has so damned much to say” (interview, Week 9).

Student's comments suggest that the aquarium visit created a lot of situational interest, resulting in positive feelings toward ecology that lasted through the post-visit ecology lessons (Week 9-10). Situational interest has been described as consisting of two phases, involving a phase in which interest is triggered and a subsequent phase in which interest is maintained (Hidi & Renninger, 2006; Krapp, 2002; Mitchell, 1993). It is likely that students' positive emotional experiences represent the feelings-related components (cf. Schiefele, 1991) of the second phase: maintained situational interest. This phase refers to a psychological state of interest that is subsequent to a triggered state, which involves focused attention and persistence over an extended episode in time. It should be noted, however, that the enduring affective experiences were not investigated further on in this study. Thus it is unknown if the week-long affective reactions represent maintained situational interest or increased individual interest – or both. In another study, it might be appropriate to carry out follow-up studies of how situational interest triggered in a museum setting might lead to individual interest and academic motivation.

The National Research Council (2009) emphasize the importance of building on prior interests (i.e. individual interests) by allowing learners choice and agency in their learning in informal learning environments. Findings from studies of interest suggest that educators can help students sustain their attention towards tasks even when these tasks are challenging. This could either mean providing support so that students may experience triggered situational interest, or providing feedback that allows them to sustain their attention, generate their own questions and select resources which promote problem solving and strategy generation (Hidi & Harackiewicz, 2000; Schraw & Lehman, 2001; Schunk et al, 2008). In this study, the outcome shows how situational interest can be triggered regardless of prior interest. Here, the prior interest of the students' seemed to be generally low regarding ecology. Nevertheless, the rich variety of sources of interest that were brought into play during the aquarium visit created a lot of situational interest, which influenced students' subsequent willingness to deal with ecology. Strong sources of situational interest can be expected to arouse and motivate the majority of students in a class, irrespective of their achievement

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level or previous interest in the subject (Hidi & Harackiewicz, 2000; Mitchell, 1993). The situational sources are largely under the control of the teacher and/or museum staff and should be considered in the planning of learning activities (Bergin, 1999). The general idea is that teachers/museum professionals should try to create situational interest in museum learning activities with the hope that this situational interest, over time, will help students develop individual interest in the topic and thereby facilitate learning. By attempting to generate situational interest in all students, teachers/museum professionals do not have to deal with the problem of trying to ensure all the individual interests of their students and structuring field trips to fit these different individual interests. The outcome of this study suggests that by making use of strong sources of situational interest like hands-on activities with live animals, surprise, novelty, and support for knowledge acquisition and social involvement, teachers and museum professionals can hopefully generate situational interest in all or most students – regardless of prior interest.

Conclusion and limitations

There has been very little previous research on situational interest in museum contexts. The purpose of this study was therefore to investigate how situational factors triggered students' interest during a field trip to an aquarium. The study has provided evidence that situational interest can be substantially generated during a fieldtrip to an aquarium. Some of these findings may seem intuitive, but are supported by data and combined with theoretical perspectives derived from the literature to empirically confirm some approaches to situational interest. Students in this study experienced situational interest through the museum docents' use of active involvement (by using hands-on activities), novelty and surprise (by using discrepant events activities and providing information), and social involvement (by providing opportunities for socialization). While the modest scope of this study limits the generalizability of the findings, there are nonetheless some noteworthy implications of this study. By selecting educational resources that trigger interest and through generating positive affect, this study suggests that teachers can positively influence students' interests and learning motivation.

Finally, I address some limitation of this study: First, the aquarium trip was unique because it involved about 90 minutes snorkel diving. The students reported the snorkel diving activity as a very intense

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experience that triggered a lot of interest. It is difficult to assess how much influence snorkeling has had on the overall experiences during the aquarium visit. Since Fjord & Belt is the only aquarium in Denmark that offers snorkeling for classes, it may be difficult to transfer the findings to other aquarium settings. It is conceivable that another student population in another aquarium setting (without snorkeling) will have less exciting experiences and thus lower interest. Thus, using this case as a paradigmatic example of how interest can be generated in a museum setting should be done with care. Consequently, it would be useful to study the sources of interest in other museum settings, for comparison.

Secondly, the limited size of the data set makes generalizations problematic. There is the issue of generalizability or how representative a small data set can be to the larger field of museum learning. The main goal of this study was to investigate sources of interest. While the study design allowed me to extract valid information with only a small number of participants (16 students in total), it should be kept in mind that, to the extent that the results are generalizable, they might well only hold for similar populations. It is likely that different attribute dimensions would emerge with different populations. For instance, as social involvement was an important source of situational interest, it is unknown whether the social dimension identified in this study might be as significant a factor for museum visitors of other age groups. Replicating this study with different populations would be an important next step.

Third, it is unclear how the term 'interest' was understood by the participants. The interview transcripts suggested that students often equated 'interesting' with 'fun' or 'liking', which possibly represented different constructs. In everyday language, the word 'interest' may refer anything that a person likes or feels attracted to. What people mean when they express their interest is therefore not obvious. While this lack of clarity is understandable given the flexible use of the word 'interest' in everyday language (Valsiner, 1992), it nonetheless points out the need to define 'interest' in visitor studies.

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